REMARKS

Before specifically discussing the rejection of the claims, the instant amendments are explained.

As seen in the Proposed Amendment, in order to more clearly define the present invention, the Applicants have instantly amended claim 1 to state that the metal oxide needles of the functional element of the present invention are metal oxide **single crystal** needles. **Support for** this amendment is found at page 27, lines 13 to 21 of the present specification, where the following description is found:

> "it is preferred that the metal oxide needles are crystalline. ..... Of these crystals, a single crystal is especially preferred."
> (emphasis added)

In connection with the instant amendment to claim 1, attention is drawn to the following description of the present specification:

> "The parallelism of the respective central axes of the metal oxide needles can be measured by the X-ray locking curve method."
> (emphasis added) (see page 40, lines 9 and 12 of the present specification)

It is well-known in the art that the measurement by the X-ray locking curve method can be performed **only** with respect to **single crystal** structures. (This is because the X-ray locking curve method is for evaluating the orientation of a **crystal axis**.)

It should be noted that, indeed, the metal oxide needles of the functional elements produced in all Examples 1 to 7 of the present specification have respective crystal axes, that is, these metal oxide needles are **single crystal** needles (although in Examples 6 and 7, the parallelism measurement (measurement of leaning angle) is not performed). This is apparent from the following descriptions of the Working Example portion of the present specification:

> " In the following Examples and Comparative Examples, the leaning angles of the crystal axes (central axes) of metal oxide needles growing on a surface of a substrate are defined as angles at which the crystal axes lean away from a straight line extending in a direction vertical to the surface of the substrate."
> (emphasis added) (see page 79, lines 7 and 12 of the present specification);
>
> "Further, the leaning angles of the crystal axes of the metal oxide needles were each 0.9 degree."
> (emphasis added) (see page 80, line 25 to page 81, line 2 of the present specification);
>
> "Further, the leaning angles of the crystal axes of the metal oxide needles were each 0.8 degree."
> (emphasis added) (see page 81, lines 19 to 21 of the present specification);
>
> "Further, the leaning angles of the crystal axes of the metal oxide needles were each 2.1 degrees."
> (emphasis added) (see page 83, lines 6 to 8 of the present specification);
>
> "Further, the leaning angles of the crystal axes of the metal oxide needles were each 1.0 degree."
> (emphasis added) (see page 83, line 25 to page 84, line 2 of the present specification); and

> "Further, the leaning angles of the crystal axes of the metal oxide needles were each 3.9 degrees." (emphasis added) (see page 85, lines 13 to 15 of the present specification).

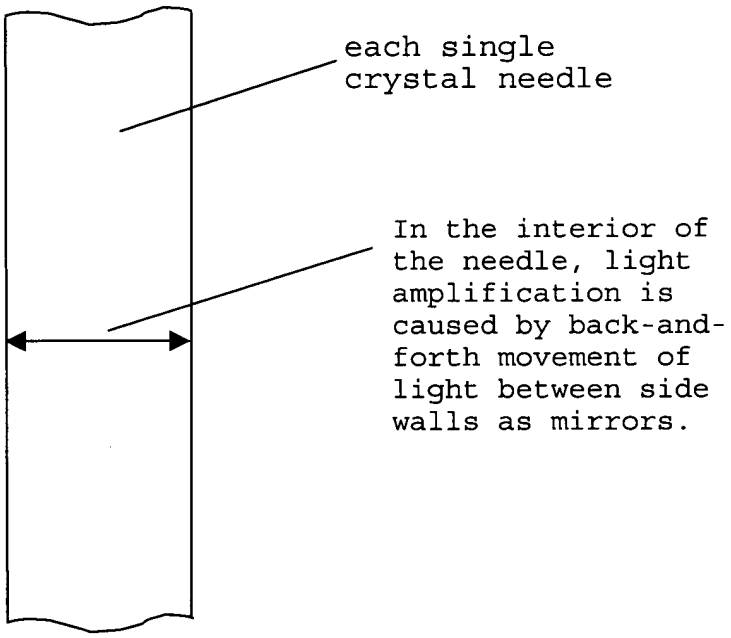
For achieving the excellent properties of the functional element of the present invention, it is very important that the metal oxide needles be **single crystal** needles. This point is described below.

For example, attention is drawn to the following description of the present specification:

> "When the functional element of the present invention (containing the metal oxide needles having an aspect ratio of 0.1 or more) is used as a laser emission element, a high output of laser can be obtained, as compared to that obtained by the conventional ZnO nanocrystals. The reason for this is as follows. In the functional element of the present invention, **laser emission occurs** in a direction perpendicular to a straight line extending in the thicknesswise direction of the metal oxide structure comprised of the metal oxide needles (wherein the thicknesswise direction of the metal oxide structure comprised of the needles corresponds to the lengthwise direction of the metal oxide needles). (emphasis added) (see page 72, lines 6 to 15 of the present specification)."

For reference, the **laser emission mechanism** as described in the above-quoted portion of the present specification is illustrated in **Fig. A** below, which shows an enlarged diagrammatic view of (a middle portion of) each single crystal needle which functions as a laser emission element.

Fig. A



It should be noted that, as well-known in the art, the **laser emission** by the mechanism as described in the above-quoted portion of the present specification (and as illustrated in Fig. A above) is **possible only when** the metal oxide needles are **single crystal** needles.

Further, attention is also drawn to the following. A **single crystal** has **excellent electrical properties**, as compared to a polycrystal. Specifically, a single crystal has **high electrical conductivity**, as compared to that of a polycrystal (which has many internal interfaces which resist electrical conduction). Further,

due to its high electrical conductivity, a single crystal not only can **save energy**, but also has **a long life**, as compared to the case of a polycrystal (which is likely to generate heat due to electrical resistance at the internal interfaces, leading to the occurrence of energy loss and thermal degeneration). In addition, the production of a single crystal can be performed with **high stability (reproducibility) of quality**, as compared to the case of the production of a polycrystal (which tends to vary largely in, e.g., grain diameter distribution.)

Thus, the functional element (having single crystal needles) of the present invention as defined in the instantly amended claim 1 can exhibit **high performances** as a component for various electric, electronic and optical devices.

With respect to the other point of the instant amendments to claim 1, the following should be noted. The Applicants have found that the expression "weighted average" recited in claim 1 is an inadvertent error and should correctly read "average". Accordingly, the **Applicants have instantly amended claim 1** to delete all occurrences of "weighted". Further, in accordance with this amendment to claim 1 to delete the expression "weighted", the **Applicants have instantly amended** the specification to delete all occurrences of "weighted".

Rejections Under 35 USC § 102(b)

Turning now to the rejection of the claims, claims 1 and 6 have been rejected under 35 U.S.C. 102(b) as being anticipated by Hijikigawa et al (U.S. Patent No. 5,140,393).

The reason for the rejection is the same as in the last office action.

The Applicants respond as follows.

The instantly amended **claim 1** of the present application is essentially directed to a functional element for use in an electric, an electronic or an optical device, comprising a substrate having on an upper surface thereof a plurality of metal oxide **single crystal** needles extending upwardly of the upper surface of the substrate, with their respective central axes arranged substantially in parallel with each other, wherein the needles have an average circle-based diameter of from 0.01 to 10,000 μm and an average aspect ratio of 0.1 or more and wherein the needles are present at a density of from 0.01 to 10,000 needles per unit area having a size of 10 μm x 10 μm at the upper surface of the substrate.

As defined in the instantly amended claim 1 of the present application, the metal oxide needles of the functional element of the present invention are metal oxide **single crystal** needles.

In this connection, attention is drawn to the following descriptions of Hijikigawa et al.:

> "From the viewpoint of finely processing techniques, however, it is desirable to use a single crystal, aggregate of fine crystals or amorphous material." (emphasis added) (see column 5, line 68 to column 6, line 2 of Hijikigawa et al.); and
>
> ...the sensor device of the invention comprises a crystalline, fine crystalline or amorphous sensor..." (emphasis added) (see column 8, lines 5 to 7 of Hijikigawa et al.).

Thus, in Hijikigawa et al., "single crystal" is **simply mentioned side by side** together with "**aggregate** of fine crystals" and "**amorphous** material". That is, in Hijikigawa et al., "single crystal" is **equated with** "**aggregate** of fine crystals" and "**amorphous** material". Needless to say, "single crystal" is **fundamentally different** from any of "aggregate of fine crystals" and "amorphous material". It should be especially noted that "amorphous" is **totally contrary** to "crystal". Therefore, it is apparent that, in Hijikigawa et al., it is **not at all** necessary that the sensor device of Hijikigawa et al. be "single crystal". This is also apparent from the fact that, in the Working Examples of Hijikigawa et al., crystal growth is **not** performed at all. In addition, it is considered that such disclosure of the Working Examples of Hijikigawa et al. shows that, in the technology

employed by Hijikigawa et al., it is **impossible** to produce a sensor device comprising a single crystal.

By contrast, as described above, the functional element of the present invention has **single crystal** needles (as demonstrated in Working Examples of the present specification) and hence can exhibit excellent performances which can be realized **only by** the **single crystal** needles. Specifically, as described above, the excellent performances which can be realized **only by** the **single crystal** needles include **laser emission function, high electrical conductivity, energy saving, long life, and the ability to be produced with high stability (reproducibility) of quality**.

By virtue of such excellent performances, the functional element of the present invention can be advantageously applied to various fields including the fields of elements for use in electric or electronic devices, such as an electron emission element of energy saving type (i.e., an electron emission element having the capability of emitting electrons even under low voltages), a high-capacitance capacitor element, a high-density memory element and a high-sensitivity sensor element; and the fields of elements for use in optical devices, such as a laser emission element (particularly a laser emission element emitting a small wavelength laser, such as an ultraviolet laser) and a highly integrated optical switch element.

Such excellent effects of the functional element of the present invention are **quite unexpected** from Hijikigawa et al. reference, which **equates** "single crystal" **with** "aggregate of fine crystals" and "amorphous material".

The functional element of the present invention having such excellent properties is a **novel** and **inventive** product which has for the first time been realized by the **novel** and **inventive** method of claim 9 of the present application.

It is firmly believed that the functional element of the present invention defined in the instantly amended claim 1 has **novelty** and **inventive step** over the sensor device of Hijikigawa et al.

It is believed that the rejection under 35 U.S.C. 102 has been removed by the instant claim amendment and the above discussion.

Rejections Under 35 USC § 103(a)

Claims 1 to 5, 7 and 8 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Hijikigawa et al. (U.S. Patent No. 5,140,393).

The reason for the rejection is the same as in the last office action.

The Applicants respond as follows.

The Applicants' discussion made above in connection with the rejection under 35 U.S.C. 102 applies also to this rejection.

It is firmly believed that the functional element of the present invention defined in the instantly amended claim 1 has **novelty** and **inventive step** over the sensor device of Hijikigawa et al.

It is believed that the rejection under 35 U.S.C. 103 has been removed by the instant claim amendment and the above discussion.

It is firmly believed that the patentability of claim 1 of the present application over Hijikigawa et al. has been established.

The Examiner states that claims 9 to 13 are allowable.

From the above, it is apparent that the cited reference has **no** teaching or suggestion about the essential features of the present invention and effects thereof.

It is believed that the present application is now in condition for allowance.

Reconsideration and early favorable action on all claims are earnestly solicited.

CONCLUSION

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact John W. Bailey (Reg. No. 32,881) at the

telephone number below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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0216-0415P

Attachment: New Abstract of the Disclosure